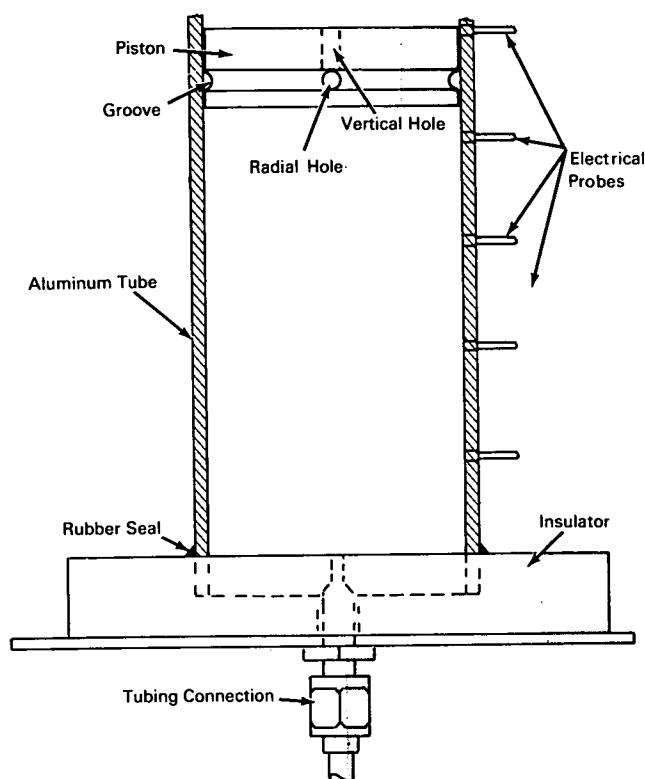


# NASA TECH BRIEF



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## Device Accurately Measures and Records Low Gas-Flow Rates



### The problem:

To design a device that will accurately measure and record low gas-flow rates. The device must provide an accurate and directly inked record of flow rates such as leaks at valve packings and seals.

### The solution:

A free-floating piston in a vertical column. The principle of operation is similar to that of an industrial gas-holder, which provides a varying volume at constant back pressure. As the piston rises in the column,

the mercury in the seal makes and breaks contact from the probe to the aluminum of the column as it passes each probe level. The probes are connected to recorder pins.

### How it's done:

The column is a seamless aluminum tube of selected diameter. The inner surface accuracy of the tubing has been improved by forcing a 0.002 oversize mandrel through its length. The piston is machined from Mylar. The outer diameter of the piston is sized for a

(continued overleaf)

sliding fit, so that it will glide down the open column quite readily, but will sink very slowly if the column is closed at the bottom. To provide an effective seal, or ring, for the piston, a ring groove is machined around the outer circumference. Four holes drilled radially connect the ring groove to a vertical hole drilled at the piston centerline.

The piston is inserted in the column and mercury is poured in the center hole until it rises even with the top of the piston. The mercury flows through the 4 radial holes, filling the groove with mercury. Since the mercury cannot "wet" the aluminum of the column, it will be retained in the groove under normal conditions, thus providing an effective seal.

To provide a signal for the recorder a row of insulated electrical probes are cemented in one side of the cylinder. The points of the probe are exactly flush with the inner surface of the column and studded on the outer end for electrical connection. As the piston rises in the column, the mercury makes and breaks contact from the probe to the aluminum of the column as it approaches each probe level. The upper probe is used as a limit switching point for automatic recycling. The probes are connected to recorder pins.

**Notes:**

1. The system may be calibrated, using an adjustable flow-rate gas supply, a low pressure gage, and a sequence recorder. From the calibration rates, a nomograph may be made for easy reduction. Temperature correction may be added for further accuracy.
2. Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
Marshall Space Flight Center  
Huntsville, Alabama 35812  
Reference: B66-10569

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: L. W. Branum  
of North American Aviation, Inc.  
under contract to  
Marshall Space Flight Center

(M-FS-1077)